AMERICAN JOURNAL OF OPTOMETRY

VOL. 10 JUNE, 1933 No. 6

LIGHTING CONDITIONS AND OTHER FACTORS TO BE CONSIDERED IN THE USE OF THE CLASON ACUITY METER*

Alvhh R. Lauer, Ph.D.
Associate Professor of Psychology
Iowa State College, Ames, Iowa

Introduction

Perhaps no instrument developed recently is of more practical importance to the optometrist in making subjective examinations than the Clason Acuity Meter. Simple of operation and positive in its action the instrument offers great possibilities for different types of clinical work. With the red-green test using the principle of chromatic aberration, correction can be made within limits of 0.12 diopter.

The acuity meter is especially valuable when quick checks of vision are necessary. It is without equal for examinations of railroad and army men, school children, and automobile drivers. After searching for a quick means of making visual examinations in the study of visual limitations of drivers[1], we adopted the Clason with results which are more than gratifying. In our portable clinic[2] between 40 and 50 drivers were checked each hour by one examiner. This study was conducted in Des Moines, Iowa, and the visual examinations were under the direction of Dr. V. V. Kirby, then President of the Iowa Association of Optometrists, assisted by Dr. Arthur Wheelock, Secretary of the State Association. Drivers were given actual driving tests in a portable driving field[3] and were then put through the field clinic.

Conditions of the Experiments

However, there are several points which seem worthy of investigation in connection with the use of the Clason. These will be placed in the form of questions together with answers supported by experimental

1. Carried on under the auspices of the National Research Council through funds given by the American Optometric Association.
2. To be described in a later issue.
3. See National Safety News, July, 1932, page 25.

*The writer is indebted to Mr. Louie Lewis, graduate student in physics, for aid in making series I and II of these experiments. Submitted for publication January 26, 1933.

evidence. They should be of interest to all Clason users. A few of the points may be eliminated by careful calculation of certain known constants. Others are more complex and require more refined techniques and careful experimentation.

After accurately spacing the instrument with respect to distance between the screen and patient, a number of experiments were performed to determine if possible the conditions which might affect readings of acuity. The shorter distance of 10 feet 9 inches was used during these measurements. By means of a black canopy the light of the room was mostly excluded from the aluminum surface of the screen. Only about 0.1 foot candle of light was allowed to reach it. The room was lighted by two full windows from the west and in the afternoon when these measurements were made the sun shone full against opaque tan shades. The latter were partly raised. The amount of indirect light falling upon a plane horizontal with the floor was between 8 and 12 foot-candles. Thus it is seen that the difference in the room lighting and screen lighting was about 10 foot candles.

Problems Studied

1. How does the angle at which the light strikes the screen affect the readings?

With the Clason placed as recommended by the manufacturers, readings were made of light reflected from the screen at different angles. A Weston Illuminometer, Model 603, No. 242 was employed in these tests. Direct readings, in foot-candles, are made from the scale. The principle is that of a specially calibrated milliameter used in connection with a photoelectric cell.

TABLE I.

Light reflected from the aluminum screen at a distance of two feet.

	Angle with projected light	Foot candles	Light thrown upon screen in foot candles	Difference in foot candles
Parallel with projected light (About 10° from normal)	0°	.10	9.6	9.50
Normal to screen	10°	.20	9.6	9.40
5° to side away from projected light	15°	.35	9.6	9.25
10° to side away from projected light	20°	.55	9.6	9.05

These data show that an aluminum screen does give different amounts of light at different angles of reflection. The maximum light is given off at the angle of incidence. Aluminum gives a semi-direct reflection of light. There is considerable diffuse reflection. This is shown by studies of aluminum surfaces used on license plates and for highway signs.[1] Using the Razek-Mülder Color-analyzer with magnesium car-

1. Lauer, A. R. and Helwig, Donald. American Highways, April, 1932, page 14.

bonate as the standard white, aluminum was found to have a reflection factor of from 30-40 per cent depending upon whether or not the surface was varnished. High grade white paper has a reflection factor of 80-90 per cent. A mirror will give only 3-4 per cent reflection under the conditions imposed by the color analyzer in which measurements are made at angles other than the angle of incidence. It suffices to say that an aluminum surface acts in some respects as a mirror and may be classed as having characteristics of both a mirror and a diffusing white surface such as non-gloss paper. The theoretical conclusion is that a pure white diffusing surface would give better visibility and consequently different readings. This raised a second point.

2. Are readings different when a white cardboard is substituted for an aluminum screen?

This was checked by five trained subjects. The measurements were rotated to avoid the onset of fatigue or other factors which might influence the acuity. Other conditions were the same as described above for this series of experiments. An average of four readings with each eye using different letters was used as the measure of acuity. In all 80 observations were made.

TABLE II.

Results obtained from white cardboard and aluminum screen

Subject	Average of four readings on white cardboard screen		Average of four readings on aluminum screen	
	R	L	R	L
F. M.	114.2	79.0	98.0	77.5
J. E. E.	141.5	9.0	133.2	9.5
A. R. L.	107.2	93.8	100.3	93.5
G. I. L.	116.8	111.8	111.8	109.8
M. E. L.	79.5	74.0	70.8	74.5

From these readings taken on five subjects it will be noted that 18 out of 20 combined observations on separate eyes showed the readings to be higher when the white cardboard was used. The average difference is 5.4 per cent in favor of the cardboard. In four out of five cases the patients had more astigmatism in the left eye than in the right. When astigmatism exists the surface is of less consequence. Also the difference is not so marked when the visual acuity is low. This result might be expected since the letters are larger when discriminated and the edges are relatively more clean cut. The cardboard seems to give more distinct letters. The same explanation is true of astigmatic eyes. Since the image is not entirely clear the slightly additional blur from the aluminum surface is not noticed.

Although these figures are based upon only a limited number of observations, it is supported by similar experiences of the writer with aluminum screens for motion picture projection. Dr. F. E. Robinson, a practitioner of our city, first suggested the problem when he complained

that the letters from the Clason were not as distinct as those of his Green Illuminated Letter Chart using a black plate glass reflecting surface.

The conclusion from these observations is that a diffuse white screen seems to give somewhat different results and that the difference is augmented by heightened acuity. It is very easy to cover the regular screen with pure white dull finished smooth cardboard. Further study was needed to solve the next problem.

3. How does the amount of light thrown upon the screen affect acuity measurements?

Measurements showed that with the screen illuminated by 0.1 foot candles indirect light; that projected upon the screen is approximately 11.0 foot candles when the test slide is removed. Replacing it cut down the light to 9.6 foot candles when the unlettered space on the slide was used. A rheostat was then placed in series with the lamp and the light cut down by increments. Readings were varied from one end of the scale

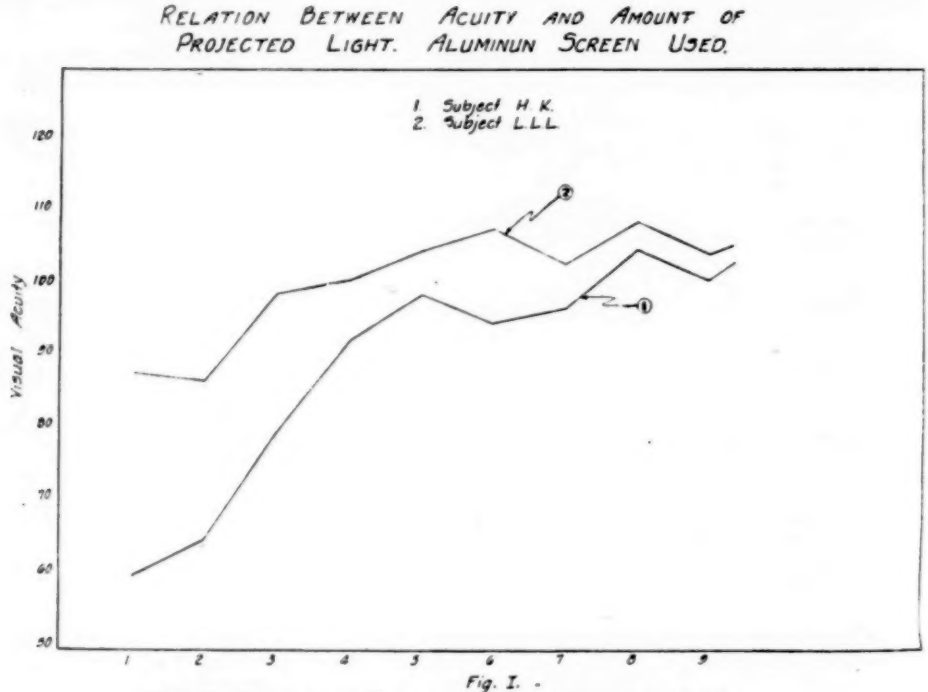


Fig. I. -
Foot-Candles from Clason bulb thrown on screen.

to the other to avoid adaptation effects. The quality of light changes somewhat under these conditions but this factor was believed to be of minor importance. Since the upper end of the scale is of most significance to us the light was not reduced below 1 foot candle.

In this figure it is obvious that the projected light may be reduced to around 7.75 foot-candles without affecting acuity readings. In terms of resistance inserted or voltage applied, no reliable data can be given as filament characteristics vary and several factors must be taken into account. It is safe to say that voltages above 100 will give satisfactory results. To reverse this interpretation one may say that a slight amount of resistance placed in series with the lamp should greatly increase the life of the bulb. If voltages are kept down to from 100 to 105 volts the bulbs should last at least 10 per cent to 15 per cent longer. In making the red-green test very thin filters should be used.

It might also be well to mention that if the aluminum screen is to be used at all it may as well be used to the best advantage. By placing the subject at the angle of incidence with respect to the projected and reflected rays the amount of light impinging upon the eye of the patient would be almost three times that reflected when at the normal angle to the screen. This is assuming the Clason to be placed so the light strikes the screen at 10° from the normal angle. By so manipulating, the current consumption would be cut down considerably and the length of the bulb greatly increased. Any illumination engineer can give expert advice on such matters.

RELATION BETWEEN ACUITY AND AMOUNT OF EXTRANEOUS LIGHT FALLING ON ALUMINUN SCREEN

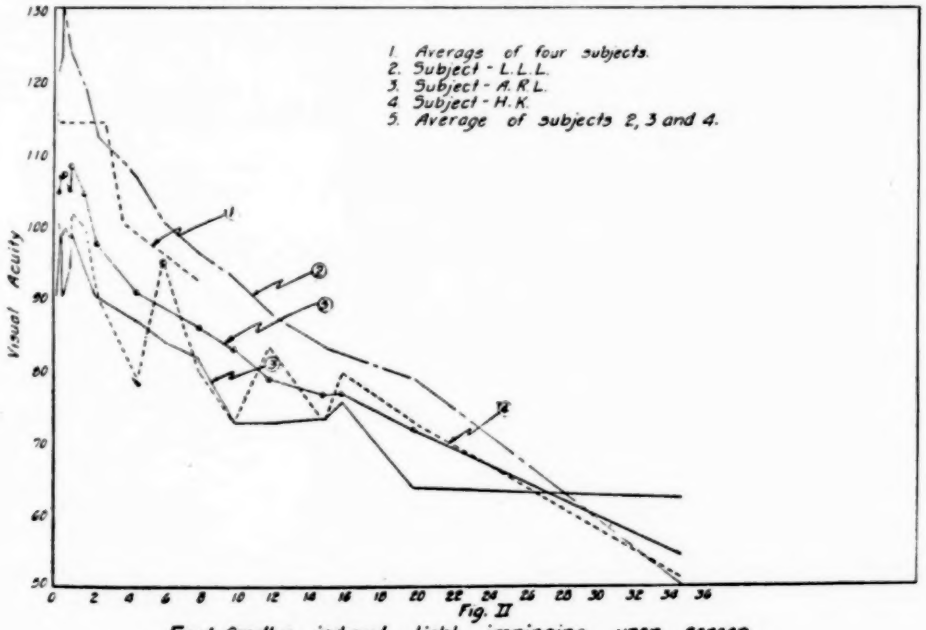


Fig. II

Foot-Candles indirect light impinging upon screen.

4. How much does extraneous light falling upon the screen influence readings?

This is a very practical question as the amount of illumination in the room is important also from the standpoint of dark adaptation. The latter point will be discussed later. Seven subjects were used in this experiment. The first part of the study was made on four women using daylight as the source. Variations up to 8 foot-candles only were introduced. Curve 1 of Figure II shows these results.

The differentiation in the curve was not adequate to determine the effect of light upon the screen and the experiment was repeated with three trained male subjects. See curves 2, 3, and 4. For light below 4.6 foot candles, a 50-watt Mazda bulb was placed at the proper distance from the screen in such a position that the rays fell upon the surface at approximately the normal angle. For illumination above 5 foot-candles a Photoflood bulb was used. There is some difference in the quality of light, but the differences are assumed to be unimportant in these measurements.

The results are shown in Figure II. Curve 5 shows the average of the three male subjects. In general it is safe to say that acuity is not affected until the extraneous light falling upon the screen gets above .9 foot-candles. By using a black cloth canopy the light can be very easily controlled. This can be done regardless of any reasonable amount of illumination in the room. Again the aluminum screen is a disadvantage as previous studies show that such surface will reflect many times more light at the angle of incidence. When the source of illumination is expansive a general "shiny" effect or mild glare is noticed. Light coming from the side will affect it much less than that falling directly upon the screen. A canopy helps in this respect.

5. The final question which arose was: does dark adaptation affect acuity readings by projected light?

Three subjects were used in this experiment. The first readings were made at night using darkness and 5 foot-candles of artificial illumination. The others were made in daylight under the conditions described at the beginning of this paper. The results are shown in Table III.

TABLE III.

Readings when the eye is dark adapted compared with those in light adaptation.

Subject	Lights out in room Dark adaptation after three minutes darkness			Room lighted by 5-foot candles* artificial illumination			Daylight readings		
	R	L	Mean	R	L	Mean	R	L	Mean
G. I. L.	99	102	100.5	105	94	99.5	112	110	111.0
M. E. L.	75	75	75.0	75	75	75.0	71	75	73.0
A. R. L.	90	80	85.0	92	98	95.0	100	94	97.0
Average	Darkness		86.8	Artificial light at night		89.8	Daylight		93.6

*At the patient's eye.

There is some evidence here that acuity is greater when the eye is light adapted even when the stimulating object remains constant as in the case of the Clason. This would indicate the need of refracting in a room as light as possible. It further suggests the need for a canopy over the screen. The use of a smooth, pure white diffusing surface as a screen seems evident. Comparison with Figure II brings out further evidence of the necessity for some means of darkening the screen as suggested above.

Summary and Conclusions

A few practical suggestions from these data may be of value to users of the Clason Acuity Meter. When carefully applied they should increase the accuracy of this excellent instrument.

1. The patient should be placed at exactly the normal angle with respect to the screen. This is true only when the aluminum or other semi-reflecting screen is used.

2. Since the calibrations of the instrument assume equal distinctness of letters at all distances a pure white cardboard of smooth dull finish should give more accurate readings than the rough aluminum surface. A specially prepared white surface would be much superior but it should be smooth, pure white, and dull finished.

3. Greater service can be obtained from bulbs if the voltage is kept between 100-105 volts. This may be accomplished by insertion of a small resistance where voltages run 110-115 volts. Consult an electrician before changing the voltage or inserting resistance. It would also be advisable to borrow an illuminometer or foot-candle meter for measuring light when making such changes.

4. Indirect light in the refracting room should not be less than 3-5 foot-candles for most work. By placing a canopy over the Clason screen very satisfactory results may be obtained in this or even greater amounts of light. The extraneous light falling directly upon the screen should never be more than 0.5 to 0.9 foot-candles for accurate results.

5. Refraction should be done in as light a room as possible. Dark adaptation seems to affect the acuity even when the stimulus object remains constant.

The points covered in this paper are given as suggestions for obtaining better results from the acuity meter. Clason users are already enthusiasts but as described above we have found some possibilities of improving the working conditions and thereby securing more consistent result. Improvement in service to one's clientele is the keynote of success. It is the recognition of these "so-called" insignificant differences which usually mark the first class refractionist in any community.

DR. ALVHH R. LAUER
ASSOCIATE PROFESSOR OF PSYCHOLOGY
IOWA STATE COLLEGE
AMES, IOWA

THE ROLE OF RECIPROCAL INNERVATION IN EXTRA-OCULAR MUSCLE BALANCE*

Edwin Forbes Tait, Ph. D., F. A. A. O.
Norristown, Pa.

One of the greatest difficulties confronting the investigator interested in the precise character of accommodation and convergence and their relationship to each other, is the lack of a common understanding of the exact meaning of the terms used to describe the various phenomena. Especially is this true when the attempt is made to relate the terms usually used to the underlying anatomical and physiological concepts as formulated in recent years by workers in those fields.

Quite as important as a reason for the slow progress of investigation in these functions is the lack of real experimental attack. The sporadic efforts which have been made in past years were truly helpful but unfortunately quite insufficient to permit any very great advance.

The first definite statement as to the nature of the relationship between accommodation and convergence was that expressed by Helmholtz[1] in which he considers that any connection between the two functions must be the result of their simultaneous use during the developmental years. Unfortunately, this statement was not quite intelligible to the physiologists of the time and the study of experimental psychology was just beginning so that no attention was paid to that viewpoint until very recent years. The problem up until 1917 was stated in anatomical and physiological terms only, ignoring the very important psychological implications.

In that year Sheard[2] organized the previous conception, recognized the reflex nature of convergence, and presented an adequate terminology, dividing all the possible variations in the relative position of the visual axes of the two eyes into three general convergence classifications: tonic, fusional, and accommodative. This work, unfortunately, was not utilized to any extent, due to the unpreparedness and lack of background of the average practitioner. For this reason also, apparently, there appeared a group of individuals in recent years who have attempted to develop systems of obtaining and analyzing ocular muscle

*Submitted for publication for Vol. 6, American Academy of Optometry, April 6th, 1932.

balance data, with the result that there has appeared a series of new terminologies, each different from its predecessor and each indefinite in its definitions. The result is, as might be expected, a lack of common understanding of the precise meanings of the terms.

Many refractionists have become used to considering esophoria for distance, let us say, as something which is of positive diagnostic value, or an esophoria or exophoria for distance, or near, as a condition of stress or strain of the extra-ocular muscles. The idea in general, seems to be that there is organized opposition between the extra ocular muscles, so that, for example, the average individual is considered to have the externus pulling back on the temporal side, and the internus on the other, and, finally, depending upon the exact pull of each, the eye comes to a position of equilibrium under dissociation or when vision is not brought into play.

That conception is certainly not the one which Sheard presented as he was thoroughly familiar with the epoch making work of Sherrington[3] in 1905, upon reciprocal innervation between opposing muscles. In terms of that work when we have an esophoria, or exophoria, or hyperphoria, we have it simply because the tonic or accommodative innervation to the extra-ocular muscles is distributed in such a manner through the nervous system that the absolute balance occurs when the visual axes of the two eyes happen to be inclined toward or away from each other.

The condition may be likened to the tonic condition of the muscles of the arm when the arm is supported in a flexed condition upon a table. One might think that when the arm is flexed that the contracting muscles are opposed definitely by the stretched muscles and that the movement of the arm up to that position occurs simply because one group of muscles contract more than the other, thus stretching by main force the opposing group.

That is certainly not true. It has been demonstrated very definitely in the last few years that while reciprocal innervation gives a contractile innervation to one muscle, it gives a distinct inhibitory innervation to the opposing one. On this basis we must formulate our ideas of ocular movements, which therefore become truly antagonistic movements on the basis of reciprocal innervation to the extra-ocular muscles. That is, when our eyes turn in, the converging muscles have a positive contractile impulse, but at the same time, the opposing muscle has a very definite inhibition.

One may have wondered, perhaps, why we do not have such a thing in the average case as a cramp or a spasm of the extra-ocular muscles. However, even the strabismus case, which apparently would be the result of a cramp, can be shown to be merely the result of an efficient, but wrongly distributed, reciprocal tonic innervation.

This reciprocal tonic innervation thus becomes the deciding factor

in the establishment of the equilibrium position of extra-ocular muscles under dissociation. When dissociation is produced with a base-down prism over one eye, so that there is diplopia for distance, the tendency is for the eyes to assume their position of equilibrium as that equilibrium is determined by the natural inherent tonicity of the extra-ocular muscles.

There is no stress or strain present, as far as the muscles themselves are concerned.

When a person has an excessive amount of esophoria for distance, but is able to preserve single binocular vision, he does so at the expense of considerable fusional innervational effort. But that fusional effort is not engaged in innervating one extra-ocular muscle to pull harder against its antagonist. The only result of that fusional innervation is to make some modification within the nervous system, so that the innervation which goes to the extra-ocular muscles is perfectly balanced, perfectly reciprocal, and the eye moves freely either to the position of equilibrium under dissociation or to the position of parallelism under fusional stress.

The maintenance of the tonicity of the extra-ocular muscles is one of the functions of a certain division of the sympathetic nervous system, the proprioceptive.

The conception of tonicity is one that is extremely important in this connection, because it means that an esophoria, or exophoria, or a hyperphoria, etc., is simply the expression of a particular state of tonicity of the extra-ocular muscles, and that the stimulus for that tonus comes entirely from the central nervous system.

It is quite possible to elaborate further upon the actual mechanism for tonicity and show how continued use of the muscle would tend to produce an increased tone and finally result in a redistribution of the tonic innervation, but the important thing is that in the presence of any type of heterophoria there is no stress upon the muscles themselves.

In terms of nerve supply, this means that the modification, or reinforcement of normal tonic innervation to the extra-ocular muscles is accomplished in the synaptic or ganglionic areas before the motor impulses and inhibitions are distributed to the muscles. We can think in terms of a schematic correlating area—actually made up of many nuclei and association tracts—into which pour the crude stimuli from the accommodative and fusional associations adding to or subtracting from the basic tonic impulses. The sum total of all the crude innervations, tonic, accommodational, and fusional, are summed up in the actual conditions of equilibrium under dissociation.

When these facts are considered we begin to see why the average strabismus case, if it is not of the paralytic variety, is quite able to turn

the strabismic eye all the way in, or out, or up, or down. This is made possible by the fact that there is nothing whatever wrong in these cases as far as the actual musculature is concerned. We are dealing here solely with a resultant reciprocal innervation.

The conditions surrounding this particular distribution of reciprocal innervation, however, may change. In other words, when an individual is using a considerable amount of accommodation for distance, he generally, if he has a good accommodative convergence reflex, supplies some extra innervational tendency for convergence.

This tendency is neutralized, but not, as many seem to think, by innervation furnished to the opposing muscles. In other words, this convergent tendency is certainly not neutralized by a positive muscular contraction on the other side. It must be neutralized in the synaptic area before the innervation is distributed to the muscles. Therefore, in a condition of esophoria, or exophoria, there is no actual strain on the muscles, but the stress is in the nervous system, especially that particular part of it which is acting as a resolving center for the innervations that reach the extra-ocular muscles.

So tonicity, then, properly speaking, is always a constant factor, and in modern physiology we speak of isotonic as well as isometric muscle contraction. When a muscle actually contracts, so that the part to which it is attached moves, there is no change of tonicity although there is a change in position and in the shape of the muscle.

With that viewpoint in mind, we can readily see that changes may have occurred in the central nervous system with the result that the tonicity to these opposing muscles, or muscle groups, has been distributed differently than it would have been had other conditions prevailed in the same organism.

To put it concretely, we may encounter a myopic case with esophoria. That esophoria may be a hangover from the time that that case was hyperopic rather than myopic. As a youngster the patient was probably hyperopic, with a strong accommodative convergent impulse, and as he became older, became myopic. But at the same time, there was no very definite reason for a new distribution of the basic tonicity to the extra-ocular muscles so that he continued to be esophoric. In such a case, there is evidently no diagnostic value to the esophoria as such. It would have to be considered in the light of our general knowledge of the conditions which would be encountered during the development of the organism.

The tonic convergence therefore is simply the esophoria, or exophoria or hyperphoria which is present in a case under the given conditions, viz., when the influence of fusion has been removed by dissociation and when the accommodative convergence is suppressed if the procedure is carried out with distance fixation.

Sheard also recognized the fact that there is a fusional source to innervation and he called the resultant convergence fusional convergence, pointing out that the function of fusional convergence was to supplement or to neutralize, whichever was necessary, the effect of tonic convergence. There has been an unfortunate tendency to take that statement to mean that the tonic convergence would determine the esophoria, etc., and that the fusional convergence would immediately combat it by innervating positively the opposing muscles so that balance might be secured.

That again is not true, because the modification introduced by the fusional convergence would be interpreted again in the central nervous system, and given forth in terms of tonicity to the extra-ocular muscles.

Fusional convergence, therefore, would be the innervation to the reciprocal distributing center which would be necessary in order to procure parallelism or fixation upon the desired point. As a corrective process, is always equal to the tonic convergence in amount and opposite to it in direction.

In an exophoric case, for example, the exophoria is due to the distribution of tonicity to the extra-ocular muscles. We call it, then, a negative tonic convergence, because it is in the divergent direction which is negative convergence.

In order to secure parallelism for distance, the tonicity would have to be opposed—not in the muscles—but in the distributing center by an equal and opposite amount of positive fusional convergence innervation.

In addition to the fusional innervation, we have usually a certain amount of accommodative convergent innervation, although it may be entirely absent in some individuals.

In general, therefore, when we accommodate we have an impulse towards convergence, and that impulse towards convergence is again added to the impulses in the distributing center, with the result that the eyes tend to turn inwards, in greater or lesser amount.

We are beginning to appreciate, more and more, the great value of the calculation and analysis of the accommodative convergence conditions in abnormal muscle cases, and fortunately, the exact values of the different types of convergence are not difficult to ascertain. In any case, by finding the tonicity for distance, and the tonicity for near, the fusional convergence, the tonic convergence and the accommodative convergence may be calculated accurately for both distance and near.

It is quite possible to develop a fairly satisfactory method of interpretation of abnormal muscular data on the basis of a rational consideration of accommodative convergence, which the writer hopes to do in a subsequent paper.

REFERENCES

[1]H. von Helmholtz, Handbuch der Physiologischen Optik, 3rd Ed., Vol. 3. Leipsig, 1910.

[2]Charles Sheard, Dynamic Ocular Tests. Columbus, 1917.

[3]Charles Sherrington, Integrative Action of the Nervous System. New York, 1906.

DR. EDWIN FORBES TAIT,
1324 W. MAIN ST.,
NORRISTOWN, PA.

SUBNORMAL VISION—A CASE REPORT

Charles E. Jaeckle, B.S., F.A.A.O.
Newark, N. J.

The case reported is that of Mrs. G., aged 28, a patient of Dr. Morris Bookstaber, seen in consultation.

Mrs. G., first seen in November, 1931, complained of very poor vision at all distances, a condition which had existed for a little more than three years. A correction had been used from childhood and good vision had been obtained with lenses until 1928, when the patient was examined by an ophthalmologist. Lenses prescribed then did not, in the opinion of the patient, improve the vision over what it had been with the previous glasses. The patient was advised that nothing further could be done for her. Discouraged and depressed, she sought no further aid until another patient suggested that she consult Dr. Bookstaber. Mrs. G. stated that she could read only very large type and this with difficulty.

Naked V.A. O.D. 2/200 O.S. Fingers at 12"

Old Rx (1928) O.D.—7.00⌒—0.50 ax 90 15/200
O.S.—6.00⌒—0.50 ax 90 4/200

Near vision: Largest type on reading card.

Examination with the ophthalmoscope revealed bilateral, complicated involvement of the posterior cortex of the lens. Tension was definitely low to palpation. The fundus was not visible in either eye.

Refraction indicated the following correction:

O.D.— 6.00⌒—1.00 ax 15 V.A. 20/100+
With subnormal vision unit 20/33—
O.S.—11.00⌒—1.00 ax 180 V.A. 20/200+
With subnormal vision unit 20/65

The patient stated that there had been some, but relatively little, diminution in vision in the three years preceding this examination. General medical examination was negative. Mrs. G. was referred back to Dr. Bookstaber, who prescribed the above correction in ordinary ophthalmic lenses, for general use. Telescopic spectacles were designed for use whenever the patient was not moving about (particularly indoors), but wished to see more clearly at distance (at the movies, for instance).

*Submitted for publication February 4, 1933.

with a reading attachment which enabled the patient to read the finest print on the reading card.

Upon re-examination after six months, no change in the media or in the refraction could be detected. The patient reported less difficulty in reading large type with her ordinary lenses, and none at all in reading newsprint with the telescopic spectacles. There was some improvement in visual acuity as indicated.

Naked	O.D. 20/200+	O.S. 8/200	O.U. 20/100
Rx (ordinary lenses)	O.D. 20/50	O.S. 20/100	O.U. 20/50+
Telescopic spectacles	O.D. 20/20-3	O.S. 20/65+	O.U. 20/20-3

Mrs. G. called again more than a year after the first visit. There was no change in the ocular condition or vision, and the patient expressed her gratitude to Dr. Bookstaber for his interest in her case.

DR. CHARLES E. JAECKLE
28 JAMES STREET
NEWARK, NEW JERSEY

SOME ASPECTS OF THE RELATION OF THE DOMINANT EYE TO THE DOMINANT HAND*

O. L. McCulloch, Opt. D., F. A. A. O.
Holyoke, Mass.

In presenting the material which comprises this paper, I find that there is a certain reluctance in my mind in so doing, because of the incompleteness of the data. However, upon reflection, if one is to wait until all the facts are known, it would probably result in never being published, because it is a question if anything more or less abstract is ever really completed.

I wish to convey my sincere thanks to those who have given me bits of information which have made possible the finding out of more information about this increasingly interesting subject.

Some years ago it struck the speaker forcibly that there must be something basic behind certain phenomena which he had observed and then and there the resolve was made to explore and bring to light some definite and concrete reasons for these phenomena.

In the routine of even a careful optometric practice, there must be and probably always will be a certain proportion of patients who return to complain, particularly about some trouble with the refraction or comfort of the eyes. The large majority of these are made comfortable and happy by almost insignificant changes in the lenses, for instance the addition or subtraction of a quarter diopter sphere from the correction of one eye or the change in axis of from two to five degrees or the alteration of the cylindric correction by as little as an eighth diopter. I am sure that you can all recall cases of similar character where you have obtained comfort and satisfaction for patients by this procedure. The fault we have variously attributed to too hurried examinations on our part or to varying conditions of the eyes themselves, the apparatus used in the examination or the adjustment of the finished correction as compared to the adjustment of the trial frame or phoropter lenses. Many times we have re-examined a patient and finding such a small change in the correction that we felt that there could not possibly be a reason for the discomfort from this source

---

*An abridgement of the material presented before the American Academy of Optometry at Philadelphia, December 6, 1931.

that we have advised the patient to wear the lenses a bit longer and the eyes would become accustomed to them and everything would be all right. Some have followed this advice and the correction eventually proved satisfactory. More however returned the second time and the third examination revealed the same changes as the second. This time the change was made more to please the patient than anything else and comfort was achieved, even though you had expressed yourself as feeling that it was too insignificant to be the cause of the discomfort.

The most important clue which I had was the fact that *usually* the complaint was about *one eye* in particular. In tracking down that bit of knowledge to obtain more it finally became increasingly evident to me that the *dominant* eye was the one which was by far the source of the reason for complaint. Further work has amply demonstrated this to my satisfaction.

Patients will tolerate, sometimes to a marked degree, an under or over correction on either eye. This produces such a blurred image that they haven't the power to improve it by the exertion of their accommodation, and therefor do not try. However, when you refract them and bring vision up to the zone of accommodative rectification, if you are not particularly careful to get the most exact correction for the dominant eye you have a complaining patient on your hands such as has been described. This of course is not true of every single patient because some people are too easily satisfied visually. This probably is the reason that some of your patients will tell you that they wear their reading correction around the house with comfort and never complain of a blur. In general though I think perhaps people are apt to be hyper-sensitive in this regard rather than otherwise. So it behooves us to be eternally vigilant in our refractions so that we may avoid the expense of extra examinations as well as the annoyance to the patient and the optometrist. So far I haven't seen any test which could be employed to ascertain whether one patient was more susceptible to slight inaccuracies in advance of the refraction. I am glad that no such test has been devised for I fear that we would be tempted to slack off and not do our best work. It is the tremendous attraction of the unknown which makes us zealous that error shall not discount our work.

This assumption on my part that the dominant eye must receive a bit more attention on our part in order that we may find the most exact refraction for that eye, brings up the question of what method is best to ascertain which is the dominant eye. One method is to instruct the patient to point with the finger at some object at a distance, preferably directly in front of them. Then it will be found that the pointing finger will be in line with the dominant eye and the object. This is open to objection as it depends in some cases as to which hand is used. Another test is when using vertical displacing prisms before each eye in a phoria test, the patient usually describes one object as stationary and one as moving. The stationary object belongs to the

dominant eye and this test also is open to objection for the reason that unless the correction is being worn we may find that with uncorrected vision the left eye for instance may be dominant but when the correction is worn it transfers to the opposite eye. This is accountable for the reason that sometimes we find uncorrected vision worse in the eventually better eye. This does not mean that the dominant eye is always the better one for there have been a few instances which I have discovered and a few more reported to me where the dominant eye was the poorer eye. The reasons for it we haven't yet been able to ascertain fully enough to make any comment worth while. The test which appeals to me as the most logical is to require the patient to hold a blank card with a hole in it about the size of a lead pencil, the card being somewhere near four inches wide and seven inches long with the hole in the center. The patient should hold the card with *both hands* at about arm's length and then while holding it steady, some single letter large enough to be easily seen by either eye should be reflected from the test chart onto the screen or mirror, and then the patient directed to locate the letter with *both eyes open* through the hole in the card. Of course the hole in the card will be held before the dominant eye and the thing can be proven by alternately covering the dominant eye and the non-dominant eye with a card and ascertaining respectively as to whether the object is seen or not. Even this test has objections much the same as all others but so far it has seemed to work out the most reliably. There is room for a better one and I hope that some of us may be stimulated to invent a bullet-proof one.

First let us deal with that class of patients who are right-handed and right-eyed, for they are very much in the majority. This it seems to me is a prefectly normal relation and usually there is not much nervous disturbance which can be traced to such a relationship between the eye and hand. Of course this group of members of the Acadmey know without my going into detail that vision is more or less a function of the autonomic portion of the central nervous system. Not but what willed actions take place with either the eye or hand, but the synchronized use of them is mainly a process which takes place through the autonomic portion of the central nervous system. The less obstructions in the path of this cycle, then the smoother the completion of the act and the least amount of nervous energy expended for its accomplishment. This it seems to me should make it clear that the ideal relationship is attained when we have this tie-up of eye and hand under present conditions in English speaking countries. The ideal might need to be something else where the writing is done in columns as in China or where the characters are read from right to left as in the case of Hebrew.

This leads us to the next group of patients who exhibit right-handedness with a dominant left eye. Generally you will find in this type of patient a tendency to headache, the location of which may be frontal, temporal or occipital. Patients of this type who do much

driving are prone to complain of headache at the base of the brain and also are subject to neuritis due to their having to turn their head somewhat to the right in order to place their dominant eye in line with the line of guidance of their car. They are very apt to complain about seeing the end-piece of the spectacles, unless care is taken to give them a large lens.

In nearly all cases where the right hand is dominant and the left eye is dominant it is advisable to use a red filter[1] over the left eye for some time each day. In quite a proportion of cases it has been possible to shift the dominant eye to the right side and in all cases where it has been accomplished greater comfort has ensued for the patient, sometimes remarkable changes in general health have taken place. I call to mind one in particular. A young woman who was employed in a factory on a box staying machine. She had to place a reinforcement of pasteboard in a die which then automatically glued it to the inside corner of a pasteboard box. This certainly called for synchronized action of hand and eye with the result that the patient was completely exhausted when night came. When I saw her she was under the care of a physician who feared that she was going to develop tuberculosis as she was much underweight, nervous and was subject to night sweats. The diet of milk and eggs and all other nourishing food which was prescribed for her seemed to accomplish little. Her refraction was just the ordinary compound hyperopic one of slight amount and the only thing which was done in addition to this was to ask her to wear a red filter over the left eye as much of the time as possible at work. This was done faithfully by her and after a period of two or three months she had improved very materially in general health and the nervous symptoms had become much less. In about a year the right eye had become the dominant one and has remained so. Occasionally if she feels the old symptoms of nervousness recurring she wears the red filter for a day or two and is relieved. She has increased her weight to normal and it is felt now that she has no more danger of becoming tubercular than any of us.

Now we come to a very interesting type of patients who are left-handed and right-eyed, but who usually write with their right hand having been taught to do so in school. They do not have as much difficulty as some of the other types and it is apparent that they should not use the left hand where the use of the eye and hand together is required.

I find that this type of patient is the one which the school authorities are able to change over to right-handedness with not too much difficulty and it is interesting to realize what a part the dominant eye played in the proposition without its being realized.

Now for an especially interesting group of patients who are left-

[1]The red filter referred to is No. 215 Fiberloid obtainable at most prescription houses.

handed and left-eyed. If we see the patient early in life, that is when the child is just starting school, we can be of invaluable assistance to them. These patients should be allowed to develop their left-handed tendencies as it is doubtful if one would be successful in changing over both the handedness and the eyedness. It is far better to encourage the use of the left hand for writing but in order that this may be done to the best advantage of the patient they should hold the pen differently than the right-handed person. The pen or pencil should be held back-hand with the point toward the body. This way the person will avoid creating a shadow and also will not be crowding the arm and hand too much against the body. Although it seems quite awkward yet writing is very legible and easily done as if done with the right hand in the ordinary manner.

It seems to me that the school authorities should be made acquainted with the test for a dominant eye so that it can be used for just such cases as these. It is the question of which eye is dominant rather than which hand which should be the deciding factor as to whether a child should be taught to use the right hand in preference to the left when he has left-handed tendencies. For years the emphasis has been on the hand without regard for the eye. It is also this type of patient who rebels at being forced to use the right hand for writing and many a whipping has been forthcoming to enforce the dictum.

It has been my pleasure to have seen several adult patients of this type who had learned the use of the right hand and who did work which necessitated the synchronized use of the eye and hand. Almost without exception they are extremely nervous and by the simple expedient of encouraging their return to the use of the left hand they have been made happy normal people again.

The last class of people with whom we come in contact is a relatively small proportion of the total and that is the people who are ambidextrous. They fall into two classes. There are some who have no dominant eye and you will find when making the test that they hold the hole in the card in such a position that both eyes get a glimpse of the target at an angle. It is perhaps my good fortune that they have not been of the class which complained of anything which could link up the association of eye and hand. There is another class however that change their dominancy according to which hand is being used. For example, if the right hand is used for some piece of work then the right eye is dominant and likewise if the left hand is used it is the left eye which is dominant. So far I have never seen an ambidextrous person who had a crossed dexterity, that is supposing the patient to be right-handed for the moment and left-eyed. I can conceive of no reason why this could not happen but I am thankful so far that it hasn't as I can visualize the difficulties.

It would seem therefor that we should include in our routine examination a dominant eye test and also the answer to the question as to which hand is dominant and as to whether it always has been.

I have seen cases where that information could not be verified but which all the signs pointed to a different handedness than that which the patient was accustomed to employ. Quite often it has been possible to go upon this somewhat objective procedure and establish comfort again by changing the handedness according to the foregoing information.

One could go on and discuss the relation of handedness in identical twins which is a very interesting subject but it suffices to say that one of the tests of whether identical twins really are identical or not depends upon the one being right-handed and right-eyed and the other left-handed and left-eyed. I have never seen a case where the dexterity of the eye and hand was crossed in cases of identical twins although again I can see no reason why it could not happen.

DR. O. L. McCULLOCH,
HOLYOKE, MASS.

THE NEWMAN FIXATION SCOPE. FOR USE WITH THE OPTHALMOSCOPE AND THE RETINSCOPE*

E. A. Newman, Opt. D.
Baltimore, Md.

The Newman Fixation Scope comprises a frame to fit upon the patient's face similar to that of a trial frame, and so constructed with a movable attachment consisting of a tube and within it a lens, a reflector and an adjustable target. The attachment being movable from one eye to the other by means of an arm and a collar fastened to a center pin which, when in position, holds the fixation of the patient's eyes in such a way that the operator has easy access to the eye under observation from any position he may assume in front of the patient without disturbing or interfering with the fixed position of the patient's eyes.

For Opthalmoscopy. First, place the scope in position on the patient's face with the fixation target over the left eye, . . . the patient looking straight ahead fixes the target within the scope projected to the left by means of a lens and a reflector. This leaves the right eye in position to be examined, . then the scope is placed over the right eye for fixation and the left eye is examined. Thus, the examiner has free and ready access to view any part of the fundus without interfering with the patient's fixation, as the target is wholly within the scope. Both eyes can be examined from one side of the patient, this is easily accomplished by reclining the patient in the chair to about 45 degrees.

For Retinscopy. In static retinscopy it is necessary that we have a condition of absolute and uninterrupted fixation with complete relaxation of the accommodation and the convergence. This is difficult to obtain since the tendency of the eyes is to wander and notice things near at hand, . . . besides the angle between the visual axis of the patient and the visual axis of the observer varies and often throws our refraction a great ways off the macula area.

With this instrument, one eye of the patient fixes the target that is focused by means of a plus lens, and by adjusting the same outwards, we repress the accommodation and the convergence, thereby producing a true static condition of the fixing eye, and what is true of the fixing

*Submitted for publicaton February 18, 1933.

eye is also true of the other eye that is under examination. *For dynamic*, we stimulate the accommodation by adjusting the target inwards.

Furthermore, it is not always possible for the refractionist to use both of his eyes equally well, naturally then he uses his dominant eye to examine both of the patient's eyes, and thereby the angle of obliquity is greater on one eye than the other and the findings are uncertain. But with this instrument you can do true macular refraction or as near to the visual axis as desired.

DR. E. A. NEWMAN
863 W. THIRTY-SIXTH ST.
BALTIMORE, MD.

FIVE CASE REPORTS*

William Smith, Opt. D., D.O.S.
Dorchester, Mass.

Several very interesting cases came to my office recently and feeling that they contain material which would be of interest to the profession as a whole, I am going to describe each in detail.

Movable Ptosis Crutch

Mr. J. D. sixty-two years old and a merchant, was operated on for vertical strabismus about eight or nine years ago. The operation proved unsuccessful. Diplopia persists, and in addition, Ptosis of the upper right lid developed right after the operation on that eye. The drooping of the lid had done away with the diplopia, as it covered the pupil. Mr. J. D. had been wearing glasses for many years. This is the second time that he consulted me. I examined his eyes for the first time in 1931. At that time I corrected his vision to 20/20 in each eye. He raised the right lid with his fingers and in that way the results were attained. I gave him bifocals and he used them satisfactorily. I re-examined his eyes in March of this year.

There was somewhat of a change between the new findings and the old ones. This was noticed in both the distance and near portions of his prescription. And Mr. J. D. wanted to know if it is possible to make him use both eyes. He knows that he is using only the left eye and the moment that he raises the right lid he gets confused because he sees everything double. He feels that his left eye bears too much of a burden, as he is using it a great deal at near. He wanted to know what I could do for him. The surgeon who operated on his eye promised very little relief when he saw him last. That was several months before he consulted me for the first time. It was purely an experiment that I decided to try on him, but it turned out to be great help to my patient when I prescribed the following correction:

Right Eye $+.50\bigcirc+.75$ X 180
Left Eye $+.25\bigcirc+.75$ X 180
Add +2.75 O.U. gave him 20/20 vision O.U.

and enabled him to read the finest Jaeger type. At distance his tonicities were 1° Exophoria and 18° Right Hyperphoria. To verify these findings, I measured them several times, and with different test instruments. I found that a 6° base up over the left eye or that amount of prism

*Submitted for publication Feb. 15, 1933.

divided equally between the two eyes, gave him single binocular vision. A stronger prism didn't feel as comfortable. I included the six diopters of prism in the distance prescription and made it up in a Kryptok for constant wear. Thus the diplopia problem was solved. Next the Ptosis had to be dealt with.

With pieces of wire, I experimented until I decided on the type of lever I wanted. First I called on several optical wholesalers for suggestions and ideas. Then I consulted with prescription opticians, but the advice they offered was worthless. I had in mind a lever that would hold the lid up, and at the same time would permit proper distribution of tears over the eyeball. Such a lever would, first of all have to be made of pliable material and so arranged as to permit movement with the lid. This I was not successful in rigging up. My next plan, and the one which I finally adopted, consisted of a lever made of solid gold, attached to the upper rim of the right eyewire by means of a hinge. This permitted the lever to be moved out of place when not used. The lever itself is one inch long and has at the lid end a ball-like tip. The lid tissue is picked by the fingers, the lever is introduced under it, and the eye is open.

I put the glasses on Mr. J. D. and arranged the lever. At first he didn't trust himself to walk across the room, expecting any instant to see two of everything, but this didn't occur. He remained at my office for some time, during which he read with his new glasses. He finally decided to walk to his place of business with them.

I saw Mr. J. D. a few days ago. He told me that he feels comfortable with the glasses. He is not troubled with chromatic aberration, nor do the prisms bother him in any way. The lever needs some adjustment. This is because he keeps removing it periodically, as his cornea gets dry. But Mr. J. D. is quite content with the arrangement and fully realizes the handicap he is under.

Congenital Corneal Involvement

Mr. C. C. was 18 in 1931, when he first consulted me. The story his sister, who brought him, told me was that the boy is subnormal mentally since birth. When a baby, his mother died, and it was the sister who brought him up. When a small boy he accidentally stuck a pair of scissors in his left eye and it had to be enucleated. The right eye has a white spot in the center of the pupil and the boy was thought to be blind in it. He never displayed signs of vision, and because of his mental state, he was allowed to grow up without receiving the benefits of an education, or the companionship of other children.

It was to secure a letter for admission to a school for the blind that he was referred to me. With his right eye he was able to count fingers at about five feet away. At first it was difficult to make him submit to the test and to get an answer to my inquiries. With his sister's assistance I managed to gain his confidence and the rest was not so hard. The intelligence quotient of the boy was not much higher than that of a two year old child.

The white spot in the center of his pupil, I learned had been there since birth. By slit lamp microscopy, transillumination and opthalmoscopy, the cornea appeared negative, and so did the outer capsule of the lens. The white spot seemed to have its termination in the posterior capsule. This eye seemed to have a persistent Hyaloid Canal.

Looking over the spot into the fundus, it appeared negative. I was not able to measure the eye ophthalmometrically as it kept jumping. He was definitely afraid of that instrument. The same happened when I tried to use the retinoscope. It was after much persuasion that he allowed me to approach his eye with the light, and I had to work fast before the boy would change his mind.

A plus seven diopter lens seemed to change the shadow movement in static skiametry, I couldn't make him to fixate the dynamic chart. so that test could not be used. I put on a plus seven diopter sphere on his eye and with it C.C. could make out the characters on the children's chart and on the illiterate chart to the quivalent of 20/40—. I prescribed this power for constant use and also put in a strong convex lens in the other eye, to balance the correction.

I saw him again in March, 1933, and he appeared to be a new person. He is now 20. Since he put on the glasses, he has made remarkable progress in his speech, demeanor and appearance. When he first came to me, his speech consisted of a few words, mostly monosyllabic. In 1933, while still referring to himself as "he," he could answer questions more readily, and even knew a few letters in the alphabet. His sister told me that he now plays the drum, by ear, of course, but he had developed an aptitude for it. His vision was at this time much improved. He could read some of the letters on the 40 foot line at 20 feet, and could make some out on the 30 foot line, although not with so much certainty.

Gastric Neurosis

I examined, Mrs. R. W. (58 years old) for the first time in 1931. It was an ordinary case of compound hypermetropic astigmatism. She has been wearing the same glasses for six years and they have broken. "But," she told me, "I am glad they broke, they gave me dreadful headaches. Uncorrected vision approximately 20/50 in the right and 20/66-1/3— in the left. The fundi appeared negative, so did the pupillary reflexes and the external eye. The ophthalmometric readings were irregular. Statically I found—O.D. +.50⌒+2.50 X Obl.: O.S.+1.50 ⌒+2.00 X Obl. I found the same readings with the dynamic retinoscope at one meter fixation and observation.

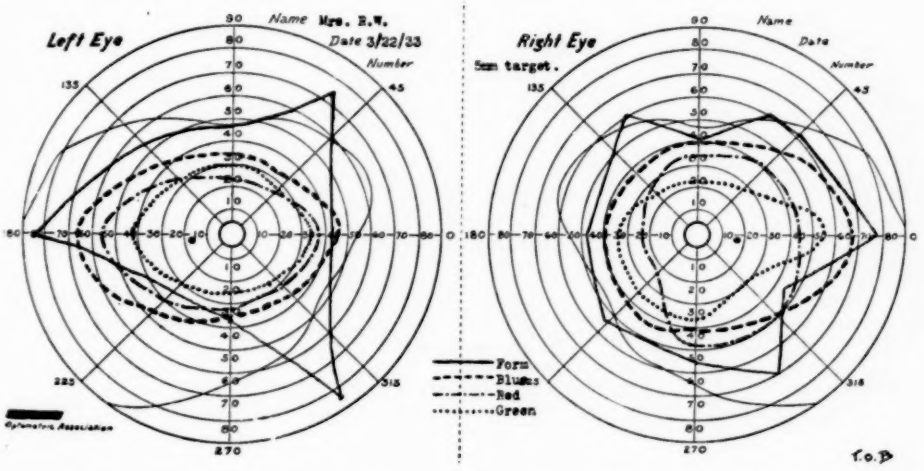
Subjectively O.D. +.50⌒+2.50 X 110 O.S. +150⌒2.00 X 120 gave her 20/20 vision in each eye separately and appeared to be the most comfortable prescription. She had 1° Exophoria at distance and no vertical imbalances. With an addition of +2.50 O.U., Mrs. R. W. read the smallest Jaeger type and could thread a needle very easily. This,

I decided to prescribe for her. Her near point tonicity was 6° of Exophoria.

On March 21, 1933, Mrs. R. W. came to see me again. Her chief complaint was a persistent left sided headache. Her physician could find no cause for it and referred her to me for an eye examination.

The fundi and reflexes appeared negative. No corneal changes were noticed. The static retinoscope disclosed more astigmatism than at the first examination. O.D + 3.75 C. O.S. + 3.00, both oblique axes, and no spherical indication. Subjectively she accepted: O.D. +1.00⌒+3.50 X 110. O.S. +2.00⌒+3.00 X 120. Vision was 20/25 and 20/20—respectively. With this prescription she had 4° of Exophoria at distance and 22° of Exophoria at the same 13 inches. She could read better without a near addition, she told me, even with her old glasses, and would not accept an addition for near at this time.

In view of the increased hypermetropia at distance, the probability of cataracts had to be ruled out. A field analysis revealed enlarged green and red fields. The fields overlapped. The left form field was constricted at the nasal and the oblique temporal sides. The right form filed was jigged.



I communicated my findings to her physician and told him that I would defer changing her lenses until I was certain that nothing systemic was causing the changed fields.

I saw this woman again at the hospital not long after this. She was referred there by her physician for further investigation, laboratory tests and X-ray examination of the head. Before the doctors proceeded to take those tests, they advised an eye examination, and a perimetric examination was again performed.

The fields taken with a Ferree Rand Perimeter at 10 degree intervals. Form, Blue, Red, and Green fields were taken and a five millimeter

target was used. The outline of the fields were approximately the same as the ones I found.

We have not completed Mrs. R. W.'s case. The doctors who examined her, suspected a Gastric Neurosis. In such cases, additional lens correction frequently relieves all the symptoms. But a searching analysis of her condition will be made at the hospital before anything definite will be done or determined.

Neurological Disturbance

The glasses with which Miss S. C. a bookkeeper and 27, came to me in September, 1932, were: O.D—25⌒—75 X Oblique; O.S.—25⌒—50 X Oblique. These she used for 2½ years, and even at the time of this visit, she finds them very good for the movies.

She complained of headaches, frontal and parietal. Frequent attacks of dizziness. This headache comes on during the later part of the day and is a sharp pain. These headaches together with the dizziness make her extremely nervous. She has hallucinations and prickly pains on top of the head and all over the body. She consulted two neurologists, but they found her in good health. The last neurologist she consulted advised a re-examination of her eyes. Her father, my patient, sent her to me.

Uncorrected vision in each eye was 20/25 O.U. she had 20/20 vision. With no correction, she had ½° of Exophoria at distance and 1½° of Exophoria at near, about 14 inches. With her old glasses she had the same amount of exophoria at distance, but at near she had 2½° of Esophoria.

The fundi were negative. Pupillary reflexes were normal. The pupils were 5-6 m/m round. Both eyes appeared normal after an external examination.

The ophthalmometric readings were as follows:

O.D.0-41½—90-41¼
O.D.0-41½—90-41¼

Static Skiametry: O.D. —1.25⌒+25X180
O.S. —1.00⌒+25X180

Dynamically at working point I found O.D. +1.00⌒+25X180: O.S. +75⌒+25X180.

With these findings, I decided to proceed no further, but to watch how she would react to the application of plus .25 cylinders axes 180. I had them made up in her own frames and ordered her to use them constantly and to report for a re-examination in one month.

I saw Miss S. C. again in October. The prescribed cylinders apparently helped. She told me that at first she couldn't see well at distance, but that the headaches and dizziness vanished "as if someone took them away." She felt well and no longer depressed or obsessed with hallucinations.

I re-examined her eyes and found no apparent change in the fundi or ophthalmometric readings. The against movement in static retinoscopy disappeared and I got my reversal with a plus .25 cylinder axis 180 O.U. This was substantiated subjectively. With it I found Orthophoria at distance. The ductions were: Adduction 24°, Abduction 12°, Supraduction and Infraduction 4° each. She had 3° of Exophoria at near (14″) and a Positive Fusion Reserve of 29 and a Recovery at 17. The Negative Fusion Reserve was at 16 and the Recovery at 8.

I kept watch over this girl's condition for another month. The glasses I prescribed she wears constantly. The last time I saw her she told me that as soon as she takes the glasses off, she feels the strain, and so she decided not to go without them. And these were my original instructions.

Uncorrected Hyperopia and Astigmia

Mr. T. R., 24, single and a hospital employee, has spent six months at the out-patient department of a very large hospital in Boston. There his physical condition has undergone thorough scrutiny in an attempt to find out the cause for the headaches, numbness at one side of the head and extending to the ears, and the loss of weight. He had no definite eye symptoms except that they get tired in strong light.

At the hospital, the doctors found a definite infection in both ears. They also discovered infection in one of the kidneys.

The doctors at the hospital attributed the headaches to the ear infection and advised T. R. to remain at the hospital so that they might be given an opportunity to study his case more thoroughly, and if necessary, to submit to an operation. It then occurred to one of the doctors to advise an eye examination, before admitting T. R. into the hospital.

Mr. T. R. asked for permission to have a private doctor examine his eyes, and was granted that, although the hospital maintains a very large Eye and Ear Infirmary, and has some very fine men on the staff. It was in this manner that Mr. T. R. came to me.

His uncorrected visual acuity was 20/20 plus O.U. and in this state he had 2° of Esophoria at distance and 5° of exophoria at 14″. His fundi appeared negative, so did the pupillary reflexes for light and accommodation and convergence. The eye movements were normal. The pupils were about 5-6 millimeters large. The external eye appeared normal.

The ophthalmometric readings were: O.D. 0-41½—90-42: O.S. 0-41½—90-42. Statically I found plus .50 cylinder O.U. Dynamically at his working distance, I found O.U. plus 1.75 plus 50X90; while dynamically at 1 meter, the spherical power was +1.25 O.U.

Subjectively he accepted +.50 cylinder axis 90 O.U. With this he had 1° of esophoria at distance. By means of the cross-cylinders I succeeded in crowding on +.50 spheres to the cylinders and with O.U.

+.50⌒+.50X90, his ductions were: Adduction 20°, Abduction 8°, Superduction and Infraduction 3°. At distance the recombinations were 16 and 2, respectively. His exophoria increased to 7° with the correction, and he had a positive fusion reserve of 32° and a recombination of 10°, while his negative fusion reserve and recombination were 23/10.

Mr. T. R. wanted me to give him a letter to the hospital telling in it what I found and if I thought that glasses would help him. I transcribed my findings in a letter and offered an opinion that glasses are necessary and that I thought that his condition to be partly due to his eyes.

A few days later, Mr. T. R. came back to me. The doctor at the hospital wants me to go on with his case, he told me. Several of the doctors read my report, then they referred it to Eye clinic, and they advised glasses.

I checked up Mr. T. R.'s eyes one month later. His headache has completely gone and there was a marked improvement in his general condition. He was beginning to feel himself again, and was beginning to put on weight. I only measured his near point Tonicities and found the exophoria at that point reduced to 3°. I told him to come back in a month and at that time, I advised him, I may have to change his glasses.

Mr. T. R. came to see me again at the appointed time, and I again checked up his eyes. He accepted an additional plus .50 sphere O.U. to the correction. With this correction—O.U. +1.00 +.50X90, and he had 20/20 vision, Orthophoria at distance, and 4° of Exophoria at 14". His headaches are no longer a regular daily occurrence. If he gets one, it is because he either exerted himself too much or because he ate something that he shouldn't have.

He still continues to go to the Ear clinic and he told me that he is making good progress toward complete recovery.

These are just a few cases I picked at random from my files. They present five different types and five different experiences. Yet each case is a problem in itself. It calls for ingenuity, and exactness.

DR. WILLIAM SMITH,
1107 BLUE HILL AVE.,
DORCHESTER, MASS.

AMERICAN JOURNAL OF OPTOMETRY

VOL. 10 JUNE, 1933 No. 6

EDITORS

DR. CAREL C. KOCH
1501 Foshay Tower
821 Marquette Avenue
Minneapolis, Minn.

DR. JACK I. KURTZ
1501 Foshay Tower
821 Marquette Avenue
Minneapolis, Minn.

Original papers, scientific communications, clinical reports, society proceedings, books for review, and correspondence should be sent to the Editor, Dr. Carel C. Koch.

Annual Subscription, $3.00 in Advance, Canada and Foreign, $4.00.
Single Copies, 40c.

Copy of advertisements must be sent in by the tenth of the month preceding their appearance. Subscriptions, applications for single copies, communications with reference to advertising or other business should be addressed to the Business Manager, Dr. Jack I. Kurtz, 1501 Foshay Tower, Minneapolis, Minn.

Published Monthly by the
American Journal of Optometry Publishing Association.

The Journal has no objection to the reprinting by other magazines of any of its articles, provided such reprints are properly credited to the American Journal of Optometry.

CHANGES IN REFRACTIVE ERRORS PRODUCED BY TRAUMA

In correcting errors of refraction, particularly in those patients showing an anisometropia, it is well to remember that marked changes in the refractive condition of one eye could possibly be produced by a trauma to the eye, or orbit, at some previous time. While these cases are rare, it is, nevertheless, a fact that they exist and as optometrists, our pre-refractive case history must be so carefully taken, that all information regarding previous accidents and injuries be made a matter of record, before the examination begins.

As is known, hyperopia and astigmatism have been produced by pressure upon the globe of the eye from behind. A fracture of the orbital walls can cause this unusual pressure, which has a tendency to shorten the optic axis and cause an artificial transient hyperopic condition, or an irregular astigmatic condition.

Three cases of this type are reported by Leplat, who found in each case a deepening of the anterior chamber of the eye. In these cases he believed that the flattening of the crystaline lens forced an increased amount of fluid into the anterior chamber. Andrews also reports a case of a stone bruise which produced an increase in the amount of hyperopia present.

Traumatic injuries also produce artificial myopic errors of refraction under certain conditions. A forward dislocation of the lens may produce a temporary myopia from the stretching of the zonula, thus arresting its elasticity and interfering with normal ciliary activity. Schiess reports a patient who had been hit in the eye with a large cork three weeks before. This eye showed 4.25 D. of myopia. Five weeks later it was 4.75 D. Five months afterward, with atropine treatment, the myopia was reduced to 0.75 D. Von Grolmann saw 3.00 D. of myopia and cyclitis follow a contusion caused by a large piece of metal striking the eye and head. In this case the myopia persisted for nine and one-half months, but normal vision was ultimately restored by treatment with atropine.

These cases of errors of refraction produced by trauma, illustrate the need for a painstaking history and check of all anisometropic cases. As long as the possibility exists, nothing must be taken for granted in our refractive procedure which would enable us as optometrists to overlook such a condition, irrespective of how rare or unusual it might be. Anisometropic cases of change in refractive error due to trauma require a type of medical treatment far different from the optometric procedure usually sufficient in the average anisometropic case, and it is our duty as optometrists to recognize these cases should one present itself.

C. C. K.

* * * * *

CYCLOPLEGICS

Kurtz, speaking before the American Academy of Optometry at Chicago last December, on the possible advantages or disadvantages of using a cycloplegic in refractive work, presented a large amount of data,[1] which indicated, that an experienced examiner can do just as satisfactory work without the use of a cycloplegic, as with it. In this Kurtz was speaking from the standpoint of personal clinical experience, as the data presented in his report is taken from a group of cases which were personally refracted by him, both with, and without a cycloplegic.

Kurtz reviews this matter from many angles giving statistical figures to support his conclusions regarding this more or less controversial matter. Among the conclusions he reaches are the following: First, that there is more disagreement between the skiascopic and subjective findings under a cycloplegic method of examination than is found when the same cases are refracted without a cycloplegic. Second, that the findings of a cycloplegic refraction are no more accurate than those of a non-cycloplegic refraction. Third, that in most cases more accurate acceptable findings are obtained in a non-cycloplegic refraction than in a cycloplegic one and Fourth, that refractive experience and the use of suitable technics are the important factors in enabling the examiner to obtain satisfactory results.

C. C. K.

[1] Kurtz, J. I. Vol. VII. The American Academy of Optometry. pp. 74-97. 1933.

PTERYGIUM

A pterygium is a rather common ocular abnormality and as such is a frequent source of annoyance to optometrists. This inflammatory process frequently produces a form of irregular astigmatism which is, in some patients, particularly difficult to correct. In certain cases even the corrected visual acuity is reduced materially by the development of the pterygium, which itself, is only correctable by means of surgery.

Meadley[1] after a microscopic study of pterygia finds that this condition is a mass of hypertrophied conjunctiva drawn up and folded back upon the cornea and secured to it. Shaped like a wedge, and generally occurring at the nasal side of the eyeball, its base lies at the caruncle and the apex on the cornea. Microscopical examination shows it to be composed of fibrillar connective tissue covered by the conjunctival epithelium. Except in old pterygia, the tissue is rich in blood vessels and if a degree of irritation is present, infiltration of small cells may be found near the apex of the pterygium. In some instances the apex of the pterygium is covered by the corneal epithelium in which case the pterygium grows between the epithelium and Bowman's membrane, destroying the latter and forming spaces lined with epithelial cells which may give rise to cysts.

C. C. K.

* * * * *

LIMITATIONS OF STEREOCAMPIMETRY

In a recent paper, Ryer and Hotaling[2] point out the well known, but little appreciated fact, that by sufficiently increasing the intensity of the illumination, that the various color fields can be made to be the same in size. To the writer's knowledge at least, this fact was first brought out by Farree and Rand some ten years ago and attempts were then made, to control color field perimetric and stereocampimetric work by having this done in windowless rooms, wherein the walls, furniture and even the instrument itself, were all coated with a dull gray paint and wherein the indirect illumination was rheostatically controlled to an exact and constant number of foot candles.

Under these conditions and only under these conditions was it possible to do anything like accurate work or get findings which had any semblance of value in making diagnostic comparisons over periods of time. In addition to these controlling safeguards, a fairly large number of tests had to be made on each patient at the start of the work so as to familiarize the patient with the technics and the variables of the test itself.

---

[1] Meadley, J. C. Pathological Conditions of the Eye seen Microscopically. British Journal of Physiological Optics. Vol. VII, No. 1, pp. 11-21. 1933.

[2] Ryer and Hotaling. Fundamentals of Optometry. Optom. Wky. 24, 1, 5-6; 1933.

In other words, color field work, besides calling for a special examining room with controlled illumination also calls for a large number of repeated tests, thus making rapid clinical diagnostic work by this means a virtual impossibility. It would seem, therefore, that this rather intricate work should be limited to certain optometric specialists who have carefully studied the technics and who have properly outfitted themselves to make the work possible. A few men in each large community to whom referred cases would be sent, could adequately examine those cases whose symptoms would indicate that they needed this form of ocular diagnostic service. C. C. K.

BOOK NOTICES

THE 1933 YEAR BOOK OF THE NEW YORK STATE OPTOMETRIC ASSOCIATION. Edited by Dr. D. K. Uttal and Dr. B. G. Rosenkranz. Published by the N. Y. S. O. A., at 2472 Broadway. New York City. 360 pp. Illustrated. $2.00. 1933.

This is the largest Year Book yet published by Uttal and Rosenkranz. The 1933 volume follows the same general style of makeup as did the 1932 book, and the published material closely resembles that published in previous years. The arrangement of the material, however, in this new volume is better than in any of the preceding books, as the material is largely grouped together, the technical papers in one section and the non-technical in another. While there is no attempt made to divide the work into definite sections, we find that the subject matter is handled in such a way that the Society Reports of the New York Association are in the first part (pp. 3-20). The report of the symposium of the New York Association in the second (pp. 21-75). Clinic Reports in the third (pp. 76-88). Short essays on various non-technical subjects in the fourth (pp. 89-206). Short technical papers in the fifth (pp. 207-324), and more short essays on this and that in the sixth (pp. 325-351).

Parts One and Two, dealing with the society and its educational symposium are very well put together and in themselves are well worth the price of the book. These first 75 pages get the work off to a start, that would have made this volume an epoch making one, had the editors been able to keep it up throughout the entire volume. However, after this good beginning one is plunged into a mass of drivel that makes one wonder if the editors were pledged to print anything and everything that came to hand. Fortunately there is an end to all things and ultimately at page 207 some more or less worthwhile material makes its appearance.

In part five will be found some very fine papers, among which, those by Pollock, Pascal, Rodgers, Baxter, McFadden, Levin and Hazell are the best. It is to be regretted that these capable men were not encouraged to go into more detail and to enlarge upon their efforts and thus use the large number of pages in this book to greater advantage. The twenty-four technical papers presented in this book, all could have been enlarged and their subject matter more thoroughly gone into without enlarging the book, as much of the non-technical stuff that *is* printed, could have been omitted with no loss whatsoever. It is to be hoped that the 1934 Year Book will correct this one outstanding remaining fault.

C. C. K.

THE ART OF LEARNING, by Professor Walter B. Pitkin. Published by the McGraw-Hill Book Company, Inc., New York, N. Y. 410 pages, cloth binding. 1931. Price $2.50.

Professor Pitkin is trying to bring to our attention one of the most important yet the most neglected subject at the present time, namely, "The Art of Learning." In the first and the second parts he expounds fully the laws of learning and advises how the mind should be used to the best advantage of the learner, what one should study and above all HOW he should study. He explains that there are four levels of learning, (a) preventative learning, (b) remedial learning, (c) expansive learning, (d) creative learning. The last is the most advanced as well as the most important type.

In parts three, four and five, Mr. Pitkin gives some practical and valuable suggestions. He insists that the proper method is the most important element in the successful learning. In the last part of the book he stresses the importance of the learner supplying himself with the proper equipment, physical as well as mental.

The book is well organized and contains many practical and helpful suggestions for the one who cares to get the most of out his learning.

J. I. K.

ANNOTATIONS
AND
SOCIETY PROCEEDINGS

The American Journal of Optometry is the Official Organ of the American Academy of Optometry, as well as the Organ of the Arkansas, Delaware, Indiana, Iowa, Maine, Maryland, Michigan, Minnesota, Nebraska, North Dakota, Oklahoma, Pennsylvania, South Dakota, Vermont and West Virginia Optometric Associations.

The following gentlemen have consented to supply items of interest from their respective sections, acting in the capacity of

ASSOCIATE STATE EDITORS

DR. E. B. ALEXANDER
Duncan, Okla.
DR. A. S. ANDERSON
Minot, N. D.
DR. J. F. ANDREAE
Baltimore, Md.
DR. O. E. BELL
Fairmont, W. Va.
DR. R. G. COLBERG
Aberdeen, S. D.
DR. C. H. DEGRAFF
Monroe, Mich.
DR. L. P. FOLSOM
South Royalton, Vt.
DR. F. W. FREEMAN
Anderson, Ind.
DR. A. J. LARGE
Winona, Minn.
DR. J. J. LIVINGSTON
Little Rock, Ark.
DR. M. B. MEYER
Wilmington, Del.
DR. J. K. MORRIS
Erie, Penn.
DR. C. A. PERRIGO
Norfolk, Neb.
DR. D E. PLAISTED
Lewiston, Me.
DR. H. R. SPITLER
Eaton, Ohio
DR. A. P. WHEELOCK
Des Moines, Ia.

THE A. O. A. CONVENTION

The A. O. A. convention will be held this year at the Palmer House in Chicago, July 2 to 7, inclusive. The following are to appear on the program: Drs. Wm. Feinbloom, Louis Jaques, Ewing Adams, Carl Shepard and Mr. Julian of the Better Vision Institute. An interesting program has been arranged, which is as follows: Sunday, July 2—Registration at 2 P. M. Meeting of the councils of presidents and secretaries of the state societies, under the direction of Dr. Thomas McBurnie, president of the American Optometric Association; 7:30 P. M., reception and musical, with refreshments. Monday, July 3—Business session of the A. O. A. all day. Tuesday, July 4—An open day (a chance to visit the World's Fair, for which tickets will be supplied for all those registered). Wednesday and Thursday, July 5 and 6—Business sessions of the A. O. A. all day. Thursday night—Grand banquet of the convention. Friday, July 7—Final committee meetings and adjournment.

* * * * *

PENNSYLVANIA STATE COLLEGE

The following statement has been issued by the president of the Pennsylvania State College of Optometry:

Students, in their enthusiasm over the recent developments in the facilities and equipment of the Pennsylvania State College of Optometry, ask repeatedly if and when the administration intends to increase the size of the student body. This is a most natural question because the larger the student body the more pride the average student has in attending the institution, not to speak of the increased

opportunities in matters of student interest such as college games, larger fraternities, and many other activities dear to the student heart.

To this view point the administration is most sympathetic. However, in this as well as in many other things which have to do with school policy, the thought of the student body will always need guidance.

It is true that this institution, with its present fixed policy of not admitting a larger freshman class than will make up a student enrollment in all classes of not more than two hundred, could very easily, due to our recent expansion, increase the student enrollment to four hundred or more without much stress on our physical plant or the necessity of increasing to any great extent the personnel of our faculty.

Our students realize this and hence are prone to speculate as to when the school administration, with the same facilities at its disposal as institutions having a much larger student body, will increase the number of matriculates. The answer could be given in very few words, but it may be better to present fully but briefly the viewpoint of the administration as to why the student body should not be increased to any great extent at the present time or in the near future.

First, it must be remembered that this institution is not a college of liberal arts. It is a professional school—a vocational school—just as the medical and dental colleges are really vocational schools.

The graduates of a college of arts and sciences have not been prepared for the practice of a profession and their college work has not equipped them with the specialized knowledge required in any business or technical enterprise. In fact, they are rarely prepared even for teaching the subjects which they have studied.

The liberal arts college course is merely an extension of the general information courses offered in the high schools and from the viewpoint of social development the more individuals who obtain such training the better for the whole social order.

Such is not the case, however, with professional training. The professional school has as its major duty the promotion of the public welfare by the supplying of well-trained men to administer to the public need.

In order, however, that its graduates will be able to function to their highest efficiency it is necessary to consider also the welfare of the practitioner. If he is to utilize his capabilities to the fullest extent, he must be assured of earning a decent living and of assuming and retaining a place in the community life befitting a professional man. Only under such conditions can he function efficiently.

The professional school, therefore, must use discretion in selecting students, accepting only that number required to meet the present public need and especially refraining from flooding a community with new graduates. The Pennsylvania State College of Optometry student body represents communities in thirty-two states and territories.

The policy of the Pennsylvania State College of Optometry on this matter has been to consider the needs of a community for optometrical services, the degree to which that need is being adequately filled, and then to make an attempt to just meet that need.

The optometrical conditions in the Pennsylvania State College of Optometry's home city, Philadelphia, illustrate this principle admirably. Only a certain number of Philadelphia applicants have been accepted each year, due to the reluctance of the college to supply more optometrists than can readily be assimilated. As a consequence, Philadelphia probably has fewer unethical optometrists and fewer objectionable methods in optometric practice than any other comparable city in the United States. This also applies in general to the state of Pennsylvania and its neighboring states.

The Pennsylvania State College of Optometry, therefore, is determined to limit its student enrollment for the best interests of both the profession and the public, and to bend its energies to educating a relatively few good optometrists rather than a larger number of mediocre practitioners. Dr. Albert Fitch, President.

* * * * *

WEST VIRGINIA ANNUAL CONVENTION

The annual convention of the West Virginia Optometric Association was held at the Daniel Boone Hotel in Charleston on the 21st and 22nd of May. The speakers at this meeting were Dr. Julius Neumueller, Dr. D. L. Gallagher, Mr. E. F. Wildermuth and Dr. A. M. Skeffington. Dr. C. C. Bell was re-elected president and Dr. Leo G. Stortz was re-elected vice president. Dr. T. P. Fields of Parkersberg was re-elected secretary, the convention also choosing this city for its 1934 convention.

* * * * *

ARKANSAS OPTOMETRIC ASSOCIATION

The annual convention of the Arkansas Optometric Association will be held at Little Rock on the 23rd and 24th of June. Dr. S. K. Lesser of Fort Worth, Texas, will be the speaker. Dr. H. Rich of Fort Smith will preside.

* * * * *

ESSEX COUNTY SOCIETY

Professor B. W. Kelly of the psychology department of DePau University was the speaker at the last monthly meeting of the Essex County Optometric Society meeting held in Newark, N. J., on May 26. His subject was, "Telibinocular Technique in the Treatment of Binocular Anomalies."

PENNSYLVANIA GRADUATE CONFERENCE

The fourth annual graduate conference was held at Pennsylvania State College of Optometry on June 5, 6, 7, 8 and 9, inclusive. The classes of the clinic were held at the new college building. Lectures and conferences were held daily from 10 A. M. to 2 P. M. and clinics from 3 P. M. to 5 P. M.

The following courses were offered: General and Ocular Histology, under the direction of Drs. C. F. Billetdoux and Michael Curcio; Visual Psychology, by Dr. Wm. J. Tait; Anatomy of the Orbit, by Drs. Isadore Kaplin and John L. Morrill, Jr.; Laboratory Diagnosis, by Drs. Wilson S. Hankins and Jacob Nevyas; Practical Work in Physiological Optics, by Drs. Julius Neumiller and T. Richard Simpson; Psycho-Physiological Basis of Accommodated Convergence Relationships, by Dr. Edwin Forbes Tait; Advanced Methods in Ophthalmic Mechanics, by Dr. John C. Neill; Refraction Analysis from Clinical Data, by Dr. Geo. A. MacElree; The Size and Shape of Retinal Images, by Dr. Julius Neumiller.

Arrangements were made for the students to have individual conferences with Drs. Maxwell Herman, S. W. Smith, H. Simmerman, Arthur C. Whitaker and O. W. Vivian.

There was a very large registration and all doctors who attended this graduate work expressed their appreciation to the Pennsylvania State College of Optometry for giving them free this special educational treat.

232
VIII